

## Age and Growth of Juvenile Striped Bass Determined by Counting Daily Growth Rings on Otoliths

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### Methods

Juvenile striped bass were collected from the Albemarle Sound during the summer and fall of 1990 as part of the N.C. Division of Marine Fisheries' Juvenile Abundance Index survey. Sampling stations are shown in Figure 71 and described in Table 60. Collection methods have been discussed in a previous section of this report (Juvenile Abundance Index by Lynn Henry). Fish were placed on ice, returned to the Elizabeth City Office, and were frozen until the otoliths could be removed in the laboratory.

Excised sagittal otoliths were stored dry in glass vials and were shipped to Panama City, Florida, for further study. Upon arrival, the whole otoliths were mounted on glass microscope slides with a small drop of thermoplastic cement. Otoliths were mounted with the proximal surface against the slide such that the concave surface faced away from the slide once embedded in the mounting medium. The sagittal plane of each otolith was ground by hand against a wet sheet of number 600 carborundum paper until the nucleus was exposed and daily rings were visible. Otoliths were not polished, instead, they were viewed through immersion oil at magnifications of 100-400X with transmitted polarized light. Otolith rings were counted only once by the author after it was determined that repeated counts resulted in a range of less than five rings from minimum to maximum counts through the range of ages represented in the total sample.

A first-ring formation date was calculated for each fish by subtracting the number of rings counted from the date when the fish was collected. A spawning date was determined by subtracting three days from the first-ring formation date for each fish.

All juveniles (n=101) were used to derive length conversion equations: TL to SL; SL to TL, and to derive a growth equation predicting the age in days of individual fish at a given length (TL mm).

### Results

Otoliths from 105 fish were examined. Four of the fish were judged to have more than 365 rings, and thus were not considered to be juveniles. These yearling striped bass were captured in the western Albemarle Sound during October and were not included in further analyses.

After plotting the lengths (SL and TL) and length (TL) and ages (daily rings) data, the linearity of the distributions was obvious. Therefore, linear regressions were used to describe the relationships.

Linear regressions were used to predict TL from SL and SL from TL:

$$TL = -0.8686 + 1.24478(SL); n = 101; r = 0.997, \text{ and}$$

$$SL = 1.132 + 0.7985(TL); n = 101; r = 0.997.$$

Age (daily rings) =  $9.9286 + 0.9405(TL)$ ;  $n = 101$ ;  $r = 0.919$ . Fish of the size range evaluated grew approximately 1 mm per day. A juvenile striped bass 50 mm TL was estimated to be 57 days old; a 100 mm fish, 104 days; a 130 mm fish, 132.2 days; and a fish measuring 160 mm TL was estimated to be 160.4 days old. The equations above should not be used to estimate the age of striped bass greater than 160 mm TL, or to convert length of fish larger than 160 mm TL.

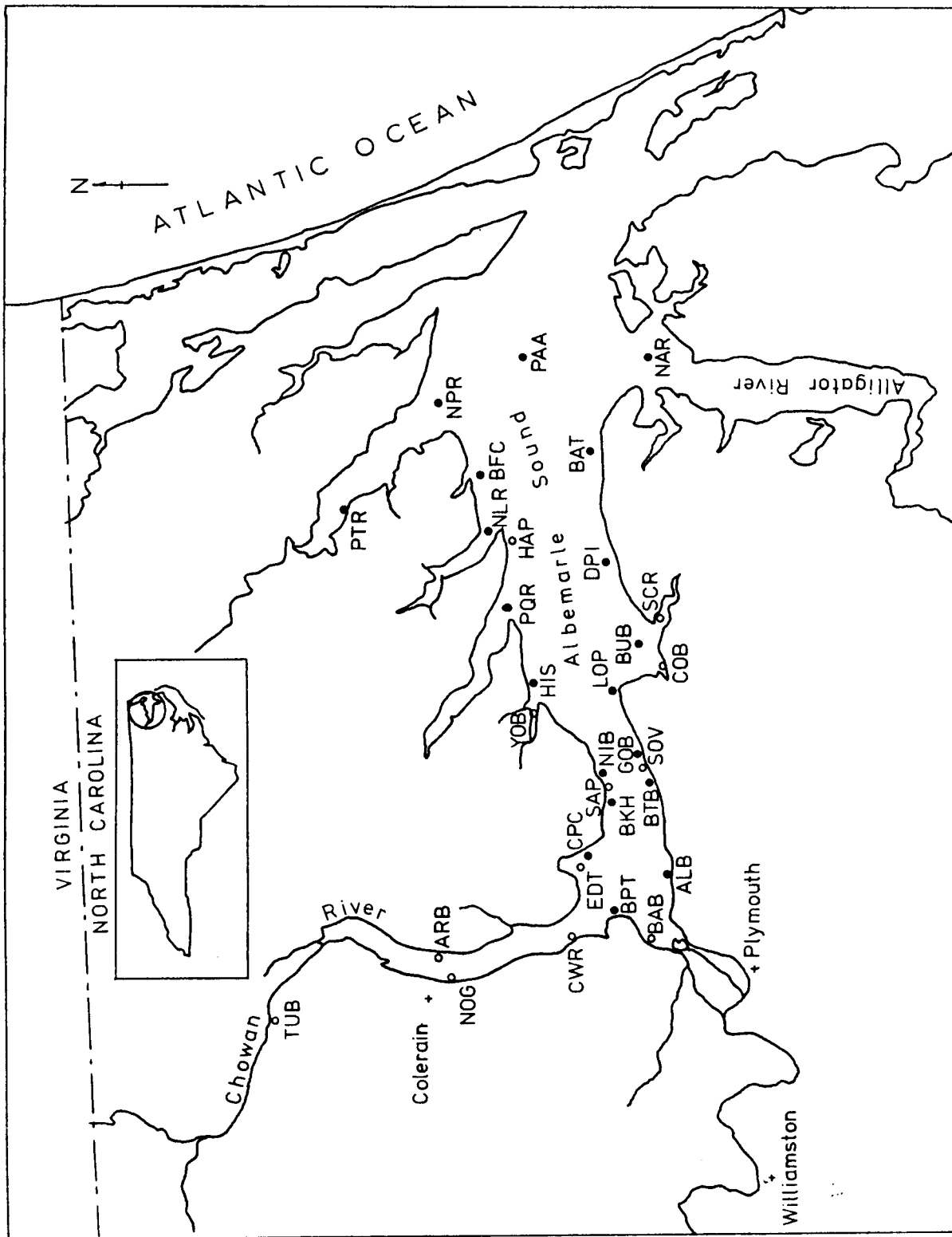


Figure 71. Sites used by the N.C. Division of Marine Fisheries to sample for young striped bass in Albemarle Sound, North Carolina, with trawl and seine. Site descriptions are presented in Table 60.

Table 60. Description of trawl and seine sampling stations used by the N.C. Division of Marine Fisheries. Asterisk (\*) indicates fish captured at these sites.

Code	Seine or Trawl	Station	Description
ALB*	Trawl	Albemarle Beach	Southern shore of western Albemarle Sound
ARB	Seine	Arrowhead Beach	Eastern shore of Chowan River opposite Colerain
BAB*	Seine	Batchelor Bay	Near the mouth of Cashie River; western Albemarle Sound
BAT	Trawl	Bombing Target	South shore of central Albemarle Sound
BFC	Trawl	Big Flatty Creek	North shore; central Albemarle Sound
BKH*	Trawl	Brickhouse Point	North shore of western Albemarle Sound
BPT*	Trawl	Black Walnut Point	Western Albemarle Sound
BTB	Trawl	Bateman's Beach	Southern shore of western Albemarle Sound
BUB	Trawl	Bull's Bay	South shore; mouth of Scuppernong River
COB	Seine	Colonial Beach	South shore; mouth of Scuppernong River
CPC*	Trawl	Cape Colony	North shore of western Albemarle, near Edenton Bay
CWR*	Seine	Chowan River	Near Chowan River bridge; western Albemarle Sound
DPI*	Trawl	Dewey's Pier	Southern shore of central Albemarle Sound
EDT*	Seine	Edenton Bay	Mouth of Edenton Bay; north shore of western Albemarle Sound
GOB*	Trawl	George's Beach	Southern shore of western Albemarle Sound
HAP*	Seine	Harvey's Point	North shore of central Albemarle Sound
HIS*	Trawl	Holiday Island	Central Albemarle Sound, near the mouth of Yeopim River
LOP	Trawl	Laurel Point	South shore; central Albemarle Sound
NAR	Trawl	Alligator River	Eastern Albemarle Sound; mouth of Alligator River
NIB*	Trawl	Nixon's Beach	North shore of western Albemarle Sound
NLR	Trawl	Little River	North shore; mouth of Little River
NOG	Seine	Mount Gould	Near Colerain on Chowan River
NPR	Trawl	Pasquotank	Mouth of Pasquotank River; eastern Albemarle Sound
PAA	Trawl	Mid-sound	Mid-sound between Pasquotank and Alligator River
PQR*	Trawl	Perquimans River	North shore mouth of Perquimans River; central Albemarle Sound
PTR	Trawl	Pasquotank	Near Coast Guard Air Station
SAP	Seine	Sandy Point	North shore; western Albemarle Sound
SCR	Seine	Scuppernong River	Eastern shore of Scuppernong River
SOV*	Seine	Soundview	Southern shore of western Albemarle Sound near George's Beach
TUB	Seine	Tuscarora Beach	Upper Chowan River
YOB*	Seine	Yeopim River	Near the mouth of Yeopim River north of Holiday Island

The number of daily rings on otoliths of the 101 juveniles ranged from 43 to 168 (Table 61). Back-calculated spawning dates ranged from 30 March to 27 June, although most (68%) were spawned from 6 May through 26 May (Table 62). Over 50% of the juveniles examined were spawned on days when Roanoke River water flows were considered favorable for survival (i.e., within the Committee's recommended boundaries). This is probably very significant since flows were favorable only 26% of the time from 1 April - 15 June. However, additional analyses are required before an evaluation can be made of the relationship of progeny survival and environmental parameters, such as water flow.

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Table 61. Calculated spawning date as determined by counting daily rings on otoliths of juvenile striped bass collected during 1990 JAI survey.

Sample Number	Capture Date	Station	Rings	TL	Ring Date	Spawn Date
1-47	10/10/90	ALB	143	118		
2-56	10/10/90	ALB	140	117	5/20	5/17
3-58	10/10/90	ALB	133	119	5/23	5/20
4-46	10/10/90	ALB	143	105	5/30	5/27
5-52	10/10/90	ALB	139	133	5/20	5/17
6-57	10/10/90	ALB	122	102	5/24	5/21
7-54	10/10/90	ALB	117	109	6/10	6/07
8-51	10/10/90	ALB	115	129	6/15	6/12
9-55	10/10/90	ALB	134	109	6/17	6/14
10-48	10/10/90	ALB	166	133	5/29	5/26
11-53	10/10/90	ALB	122	104	4/27	4/24
12-50	10/10/90	ALB	142	144	6/10	6/07
13-49	10/10/90	ALB	126	115	5/21	5/18
14-45	10/10/90	ALB	126	115	6/06	6/03
15-41	10/25/90	BTB	168	131	4/25	4/22
19-33	10/02/90	DPI	140	160	5/23	5/20
20-32	7/11/90	YOB	64	50	5/08	5/05
21-08	7/11/90	YOB	63	52	5/09	5/06
22-22	7/17/90	BKH	70	50	5/08	5/05
23-10	7/17/90	BKH	62	57	5/16	5/13
24-17	7/17/90	BKH	64	54	5/14	5/11
25-29	7/17/90	BKH	57	56	5/21	5/18
26-11	7/17/90	BKH	64	54	5/14	5/11
27-12	7/17/90	BKH	63	55	5/15	5/12
28-18	7/17/90	BKH	62	46	5/16	5/13
29-19	7/17/90	BKH	62	56	5/16	5/13
30-20	7/17/90	BKH	54	48	5/24	5/21
31-16	7/17/90	BKH	63	54	5/15	5/12
32-15	7/17/90	BKH	57	54	5/21	5/18
33-14	7/17/90	BKH	56	54	5/22	5/19
34-13	7/17/90	BKH	59	56	5/19	5/16
35-24	7/17/90	BKH	58	51	5/20	5/17
36-28	7/17/90	BKH	53	54	5/25	5/22
37-27	7/17/90	BKH	54	49	5/24	5/21
38-26	7/17/90	BKH	43	43	6/04	6/01
39-09	7/17/90	BKH	57	55	5/21	5/18
40-30	7/17/90	BKH	53	51	5/25	5/22
41-21	7/17/90	BKH	54	53	5/24	5/21
42-25	7/17/90	BKH	49	55	5/29	5/26
43-23	7/17/90	BKH	54	54	5/24	5/21
44-31	7/17/90	BKH	50	49	5/28	5/25
45-35	7/17/90	BKH	51	54	5/27	5/24
46-36	7/06/90	CWR	92	89	4/05	4/02
48-06	7/06/90	CWR	73	91	4/24	4/21
49-05	9/12/90	BKH	88	97	6/16	6/13
50-37	9/12/90	BKH	84	90	6/20	6/17
51-34	7/06/90	EDT	95	91	4/02	3/30
52-38	7/09/90	SOV	97	102	4/03	3/31
53-01	9/25/90	CPC	109	100	6/08	6/05
54-02	9/12/90	NIB	142	137	4/23	4/20
55-03	9/12/90	NIB	124	132	5/11	5/08
			120	142	5/15	5/12

Table 61. (Continued)

Sample Number	Capture Date	Station	Rings	TL	Ring Date	Spawn Date
56-04	9/12/90	NIB	106	115	5/29	5/26
57-39	9/25/90	GOB	161	145	4/17	4/14
58-40	9/25/90	GOB	114	110	6/03	5/31
59-97	7/25/90	PTR	103	77	4/13	4/10
60-95	7/31/90	ALB	91	65	5/01	4/28
61-96	7/25/90	HIS	97	78	4/19	4/16
62-91	7/31/90	BKH	79	65	5/13	5/10
63-92	7/31/90	BKH	82	62	5/10	5/07
64-93	7/31/90	BKH	78	72	5/14	5/11
65-94	7/31/90	BKH	77	77	5/15	5/12
66-98	7/25/90	PQR	64	63	5/22	5/19
67-99	7/25/90	PQR	77	64	5/09	5/06
68-100	7/25/90	PQR	67	74	5/19	5/16
69-101	7/25/90	PQR	74	81	5/12	5/09
70-102	7/25/90	PQR	76	63	5/10	5/07
71-103	7/25/90	PQR	71	59	5/15	5/12
72-104	7/25/90	PQR	72	67	5/14	5/11
73-105	7/25/90	PQR	63	59	5/23	5/20
74-71	8/15/90	BKH	78	65	5/29	5/26
75-72	8/15/90	BKH	79	73	5/28	5/25
76-70	8/08/90	HAP	76	83	5/24	5/21
77-67	8/15/90	NIB	79	85	5/28	5/25
78-69	8/15/90	GOB	82	93	5/25	5/22
79-83	8/07/90	SOV	85	75	5/14	5/11
80-84	8/07/90	SOV	76	75	5/23	5/20
81-62	10/10/90	NIB	133	153	5/30	5/27
82-63	10/10/90	NIB	137	133	5/26	5/23
83-64	10/10/90	NIB	136	147	5/27	5/24
84-65	10/10/90	NIB	163	140	4/30	4/27
85-66	10/10/90	NIB	146	148	5/17	5/14
86-77	8/07/90	BAB	94	98	5/05	5/02
87-78	8/07/90	BAB	107	130	4/22	4/19
88-68	8/08/90	DPI	73	98	5/27	5/24
89-85	7/31/90	BTB	76	63	5/16	5/13
90-59	10/10/90	BTB	139	120	5/24	5/21
91-60	10/10/90	BKH	102	100	6/30	6/27
92-61	10/10/90	BKH	104	115	6/28	6/25
93-79	8/07/90	HIS	93	90	5/06	5/03
94-80	8/07/90	HIS	74	91	5/25	5/22
95-81	8/07/90	HIS	82	81	5/17	5/14
96-82	8/07/90	HIS	86	92	5/13	5/10
97-86	7/31/90	CPC	75	83	5/17	5/14
98-87	7/31/90	CPC	83	78	5/09	5/06
99-88	7/31/90	CPC	75	62	5/17	5/14
100-89	7/31/90	CPC	83	77	5/09	5/06
101-90	7/31/90	CPC	64	60	5/28	5/25
102-73	8/29/90	BKH	94	82	5/27	5/24
103-74	8/29/90	BKH	79	73	6/11	6/08
104-75	8/29/90	BKH	97	82	5/24	5/21
105-76	8/29/90	BKH	102	84	5/19	5/16

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Table 62. Spawning date frequency distribution for juvenile striped bass aged by counting daily rings on otoliths.

Week Spawned	Number of Fish	Percent of Total
March 25-31	2	1.98
April 1-7	1	0.99
April 8-14	2	1.98
April 15-21	4	3.96
April 22-28	4	3.96
April 29-May 5	4	3.96
May 6-12	20	19.80
May 13-19	20	19.80
May 20-26	29	28.71
May 27-June 2	4	3.96
June 3-9	5	4.95
June 10-16	3	2.97
June 17-23	1	0.99
June 24-30	2	1.98
Total	101	99.99